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Original research article

Evaluation of the relationship of mucous retention cyst with the restoration and loss situations of the teeth adjacent to the maxillary sinus with panoramic radiographs

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Abstract

Objective: This study aims to evaluate whether the restoration and loss of teeth adjacent to the maxillary sinuses affect the formation of mucous retention cysts by examining the panoramic radiographs of patients who came to Fırat University Faculty of Dentistry for various reasons.

Materials and Method: In the study, the panoramic radiographs of a total of 1585 patients, 863 women and 722 men, aged 18–65, who came to Fırat University Faculty of Dentistry for treatment between 2021 and 2022 were retrospectively examined. Existing restorations such as root canal treatment, filling, and crown on the upper first premolar, upper second premolar, upper first molar, and upper second molar teeth that are in relation to the maxillary sinuses, restoration need (canal treatment, filling, crown, caries), and loss status were determined. SPSS (SPSS® v22.0; SPSS Inc.,Chicago, USA) program was used to analyze the data obtained statistically. The data were analyzed using the Pearson Chi-Square test and the Bonferroni method. $p<0.05$ was considered statistically significant.

Results: Of the 313 patients with mucous retention cysts, 163 (52.1%) were female and 150 (47.9%) were male. In patients with mucous retention cysts, 204 (65.2%) of their upper first premolar teeth, 207 (66.1%) of their upper second premolar teeth, 265 (84.7%) of their upper first molars, and 201 (64.2%) of their upper second molars were restorated, resulting in tooth loss.

Conclusion: Restoration, tooth loss and caries in the maxillary posterior region are effective in the formation of mucous retention cysts. It is important to routinely examine and evaluate this region for mucous retention cysts.

Keywords: Maxillary Sinus; mucous retention cyst; panoramic radiography

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[Abstract in Turkish is at the end of the manuscript]

Introduction

Mucous retention cysts (MRC), which are seen in panoramic radiography (PR) taken during routine dental examination and are generally asymptomatic, are called ''true cysts'' because they have a thin epithelial lining formed as a result of the blockage of the salivary gland ducts. Pseudocysts, on the other hand, lack an epithelial wall and arise from the diffuse subepithelial accumulation of inflammatory exudate. Since both cannot be distinguished radiologically, many researchers do not distinguish between MRC and pseudocysts and define them as sharply defined, dome-shaped radiopaque formations originating from the antral wall on radiography.[1,2] Since PR is the most preferred imaging method due to its advantages, such as low radiation dose, ease of application, low cost, and easy accessibility, it provides valuable information in

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maxillary sinuses (MS) evaluation and MRC detection.[3] The etiology of mucosal cysts is commonly thought to be inflammatory and traumatic causes, such as allergy, barotrauma, and rhinitis; associated symptoms include headache, nasal obstruction, facial pain, postnasal drip, and nasal discharge.[4] Pain in this area is often confused with dental pain.[4,5] It is also known that the presence of microorganisms in the apical region of the teeth and dental infections cause inflammatory changes in the sinus membrane and cause MRC.[5-7] Apical periodontitis, root canal treatment, periodontal bone loss, protrusion of tooth roots into the MS, and oro-antral fistulas are among the main dental problems that can cause a sinus infection.[8] The existing restoration, the need for restoration (caries affecting the dentin), and the loss of teeth in the maxillary premolar and molar regions are also the results of the dental infection process that occurred in the past, which can also affect the maxillary sinuses.[9] As a result of these dental problems, the need for treatment is determined, and procedures such as filling, root canal treatment, or extraction are performed.

In this study, we aim to determine the relationship between some dental conditions and MRC formation on panoramic radiographs and to contribute to the diagnostic protocol in differentiating symptoms associated with MS and dental conditions.

Materials and Method

In the study, radiographs of a total of 1585 patients, 863 females and 722 males, aged 18–65, who came to Fırat University Faculty of Dentistry for treatment between 2021 and 2022, were retrospectively examined. Radiographs of patients whose informed consent forms were obtained were used. Ethical approval numbered 2022/01-18(6289) was received for the study by the Fırat University Non-Interventional Ethics Committee on January 13, 2022. Radiographs whose image quality was not suitable for examining the MS and adjacent teeth were not included in the study. All PRs were taken by the Planmeca Promax 2D Digital Panoramic X-ray Device (Planmeca Inc., Helsinki, Finland) in accordance with the manufacturer's instructions. The images were evaluated together by a radiologist and a 2-year radiology assistant; dome-shaped, homogeneous, well-defined, radiopaque structures located on the inferior and lateral walls of the MS were defined as MRC (Figure 1). MRC was detected in 313 of the radiographs examined. Existing restorations such as root canal treatment, filling, and crown on the upper first premolar, upper second premolar, upper first molar, and upper second molar teeth that are in relation to the MS, restoration need (canal treatment, filling, crown), and loss status were determined. The right MS was evaluated when examining the teeth on the right side, and the left MS was evaluated when examining the teeth on the left side. Restorations and caries requiring restorations at the enamel level that were not radiographically related to dentin were also excluded from the study.

Statistical analysis

SPSS (SPSS® v22.0; SPSS Inc., Chicago, USA) statistical program was used for the statistical analysis of the data obtained. The data were analyzed using the Pearson Chi-Square test and the Bonferroni method. In the study, $p<0.05$ was considered statistically significant.

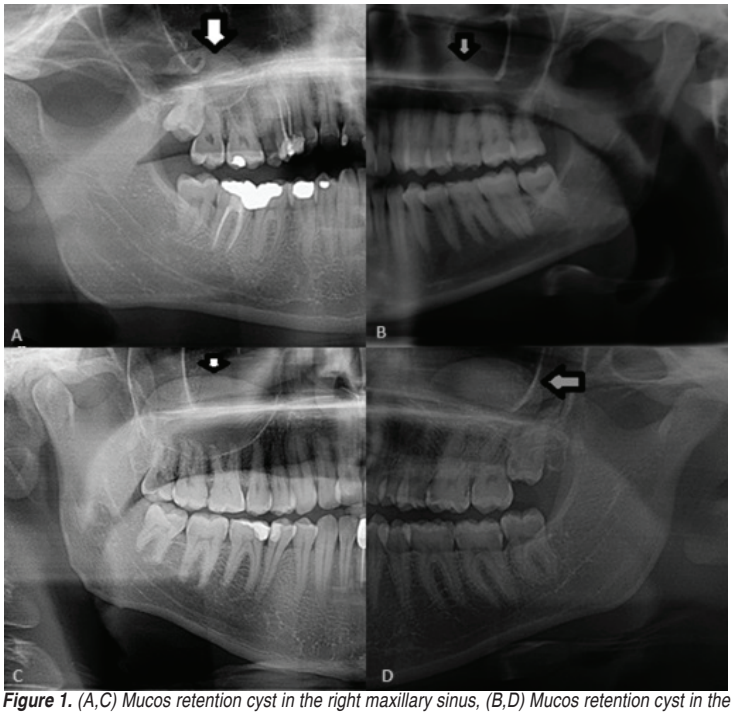

Figure 1. *(A,C) Mucos retention cyst in the right maxillary sinus, (B,D) Mucos retention cyst in the left maxillary sinüs*

Results

The overall mean age of 1585 patients was 35.6 ± 11.9 years, the mean age of female patients was 35.4 ± 11.9, and the mean age of male patients was 35.9 ± 11.9 years (Table 1).

Of the 313 patients with MRC, 163 (52.1%) were female and 150 (47.9%) were male. MRC was detected at similar frequencies in both genders, and no statistically significant difference was found (p > 0.05) (Table 1).

It was observed that 204 (65.2%) of the upper first premolar teeth of the patients with MRC were restorated and lost, and 105 (8.3%) were restorated and lost but did not have MRC. This difference in the prevalence of MRC was found to be statistically significant (p<0.001). MRC was more common in patients with restoration and loss of upper first premolar teeth (Table 2).

It was determined that 207 (66.1%) of the upper second premolar teeth of the patients with MRC were restorated and lost, and 79 (6.2%) were restorated and lost but did not have MRC. It was observed that restorations and loss in the upper second premolar teeth increased the occurrence of MRC, which was statistically significant (p<0.001). MRC was more common in patients with restorations and the loss of upper second premolar teeth (Table 2).

It was determined that 265 (84.7%) of the upper first molars of the patients with MRC were restorated and lost, and 146 (11.5%) were lost even though there was no MRC. This difference in MRC formation was found to be statistically significant (p<0.001). It was observed that restoration, caries, and loss of upper first molars increase MRC formation (Table 2).

It was determined that 201 (64.2%) of the upper second molar teeth of the patients with MRC were restorated and lost, and 81 (6.4%) were lost even though there was no MRC. This difference in MRC formation is statistically significant (p<0.001). Restoration and loss of upper second molar teeth increase the occurrence of MRC (Table 2).

Table 1. *Evaluation of the presence of MRC according to age and gender*

	Age		
Gender	N-(n-%)	Mean ± S. Deviation	Median (min-max)
Female	863(163-52.1%)	35.4 ± 11.9	34 (18- 65)
Male	722(150-47.9%)	35.9 ± 11.9	35 (18- 64)
Total	1585(313)	35.6 ± 11.9	34 (18- 65)

N: Number of people included in the study

n: Number of Mucous Retention Cysts

Table 2. *The relationship between the presence of caries, restoration, and loss of first premolar, second premolar, first molar, and second molar teeth and MRC*

	Mucous Retention Cyst			
	Present (n=313)	Absent (n=1272)	Total(n=1585)	p
Caries, Restoration, Loss of First Premolar				
Yes	204 (65.2)[a]	105 (8.3)[b]	309 (19.5)	<0.001
No	109 (34.8)[a]	1167 (91.7)[b]	1276 (80.5)	
Caries, Restoration, Loss of Second Premolar				
Yes	207 (66.1)[a]	79 (6.2)[b]	286 (18)	<0.001
No	106 (33.9)[a]	1193 (93.8)[b]	1299 (82)	
Caries, Restoration, Loss of First Molar				
Yes	265 (84.7)[a]	146 (11.5)[b]	411 (25.9)	<0.001
No	48 (15.3)[a]	1126 (88.5)[b]	1174 (74.1)	
Caries, Restoration, Loss of Second Molar				
Yes	201 (64.2)[a]	81 (6.4)[b]	282 (17.8)	<0.001
No	112 (35.8)[a]	1191 (93.6)[b]	1303 (82.2)	

n= Number of panoramic films included in the study

a-b= Show the difference between the presence of restoration and loss in the tooth and the presence of a mucous retention cyst.

Discussion

The relationship between maxillary posterior teeth, which are closely related to the sinus, sinus pathologies, and MRC, is reported in various studies in the literature.[8-12] It is also known that the presence of microorganisms in the apical region of the teeth causes sinus pathologies and MRC without causing perforation in the sinus membrane.[7,13] In this study, we investigated the relationship between restoration, root canal treatment and extracted teeth as a result of odontogenic infections in the maxillary posterior region and MRC formation.

PR is one of the most commonly used 2-dimensional imaging methods in routine examination, and since they can show both maxillary sinuses in a single image, they allow the physician to evaluate both MS at the same time comparatively.[14]

Estimated risk factors for MRC formation have been examined in many studies, and it has been observed that MRC occurs between 3.2% and 14%.[13-16] Rodrigues *et al*. [15] analyzed whether there was a relationship between the relative humidity of the air, environmental temperature and month with MRC formation, and they found the MRC formation to be 3.19%. However, no statistical correlation was found between MRC and the relative humidity of the air, average temperature and month.[15] Valla *et al*. [16] examined the relationship between dental pathologies and root canal treatments with mucosal thickening and MRC formation and found a significant relationship between dental pathologies and mucosal thickening, but there was no relationship was found with MRC.[16] Basio *et al*. [17] examined the formation of MRC during the orthodontic treatment process and found the formation of MRC to be similar to the general population.[17] Yeung *et al*. [18], in their study examining the relationship between dentition status, endodontic status, and periodontal status with the presence of MRC, found a significant relationship between age and endodontic status with the presence of cysts, but no significant relationship was found with the others.[18] In this study, it was found that odontogenic infections, which are estimated risk factors for MRC formation, were more effective, and their relationship with MRC formation was more significant.

In a study, it was determined that periapical lesions increased MRC formation by 4.1 times, while endo-periodontal lesions increased MRC formation by 23.8 times.[19] In our study, it has been observed that high rates of restoration and tooth loss, mainly in the upper first molar, upper second molar, and first and second premolar teeth, have a high relationship with the formation of MRC. This may be due to the examination of dental procedures, such as root canal treatment performed in the presence of an apical lesion or extraction, which is a more advanced treatment option, in our study.

Although some studies in the literature indicate that the pathological conditions of the teeth adjacent to the sinus are effective in causing symptoms by changes in the sinus membrane, there are also studies showing that they do not have any effect.[20,21] Kanagalingam *et al*.[22] investigated the presence of MRC in asymptomatic patients, and they reported the frequency of retention cysts with paranasal sinus computed tomography examination as 35.6%. Researchers emphasized that the presence of MRC in asymptomatic patients does not indicate a sinus or dental disease, and therefore sinus surgery is not necessary.[22] However, in the presence of MRC, it is important to make routine control and perform necessary dental treatments without postponement in the maxillary posterior region.

Some studies investigating the relationship between MRC incidence and gender state that there is no definitive relationship with gender.[23,24] A study found that MRC was more common in female in their third decade than in other age groups and genders.[25] White and Pharoah [26] reported that the incidence of MRC is higher in males than in females. In this study, it was determined that the incidence of MRC in males and females was close to each other and that there was no significant relationship between gender and MRC occurrence. The reason for the different results seen between gender and MRC in the literature may be the female-male ratios included in the studies, and geographical and regional differences.

Although PR, the most commonly used imaging method in diagnosis and treatment planning, is helpful in diagnosing MRC and determining its prevalence, it has disadvantages such as reducing three-dimensional structures to two dimensions, frequent superimpositions, and image distortions. For this reason, some authors state that when invasive procedures such as implants and advanced surgery are planned, it would be useful to use advanced imaging methods that provide three-dimensional imaging for MRC detection.[27] This is the limitation of our study. Moreover, although our study shows that the dental factors, we examined are effective in MRC formation, more studies are needed with different populations to fully understand the mechanism of MRC formation.

Conclusion

When all the results were evaluated, it was seen that caries, restoration, and loss of teeth in the maxillary posterior region were effective in the formation of MRC. Routine examination of this region for MRC is important in terms of procedures to be performed in this area and identifying and differentiating patients' complaints.

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Mukos retansiyon kistinin maksillar sinüse komşu dişlerdeki restorasyon ve kayıp durumlarıyla ilişkisinin panoramik radyograflarla değerlendirilmesi

Özet

Amaç: Bu çalışmada, Fırat Üniversitesi Diş Hekimliği Fakültesi'ne çeşitli sebeplerle gelen hastaların panoramik radyografileri incelenerek; maksillar sinüse komşu dişlerin restorasyon ve kayıp durumlarının mukos retansiyon kisti oluşumuna etkisi olup olmadığının değerlendirilmesi amaçlanmaktadır.

Gereç ve Yöntem: Çalışmada, 2021-2022 yılları arasında Fırat Üniversitesi Diş Hekimliği Fakültesi'ne tedavi için gelen, 18-65 yaş aralığında bulunan, 863'ü kadın, 722'si erkek toplam 1585 hastanın panoramik radyografı retrospektif olarak incelendi. Maksillar sinüs ile ilişkisi olan üst birinci premolar, üst ikinci premolar, üst birinci molar, üst ikinci molar dişlerdeki, kanal tedavisi, dolgu, kaplama olan mevcut restorasyon, restorasyon ihtiyacı (kanal tedavisi, dolgu, kaplama, çürük) ve kayıp durumu tespit edilip kaydedildi. Elde edilen verilen istatistiksel analizi için SPSS (SPSS® v22.0; SPSS Inc., Chicago, USA) programı kullanıldı. Veriler Pearson Ki-kare testi ve Benferroni metodu kullanılarak değerlendirildi. P<0.05 istatistiksel olarak anlamlı kabul edildi.

Bulgular: Mukos retansiyon kisti olan 313 hastanın 163 (%52.1)'ü kadın 150 (%47.9)'si erkek olarak tespit edildi. Mukos retansiyon kisti tespit edilen hastaların üst birinci premolar dişlerinin 204 (%65.2)' ünde, üst ikinci premolar dişlerinin 207 (%66.1)' sinde, üst birinci molar dişlerinin 265 (%84.7)' inde, üst ikinci molar dişlerinin 201 (%64.2)' inde restorasyon ve kayıp olduğu tespit edildi.

Sonuç: Maksiller posterior bölgedeki restorasyon, diş kaybı ve çürüklerin mukos retansiyon kisti oluşumunda etkili olduğu görülmüştür. Mukos retansiyon kisti için bu bölgenin rutin olarak muayene edilmesi ve değerlendirilmesi önemlidir.

Anahtar Kelimeler: Maksiller Sinüs; mukoz retansiyon kisti; panoramik radyografi Figure 1. (A,C) Mucos retention cyst in the right maxillary sinus, (B,D) Mucos retention cyst in the left maxillary sinüs